

*Original Article***Accuracy of Dysphagia Severity Scale rating without using videoendoscopic evaluation of swallowing**

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**ABSTRACT**

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**Objective:** This study compared the Dysphagia Severity Scale (DSS) scores obtained from clinical findings and screening tests by a skilled nurse with the DSS scores obtained by videoendoscopic evaluation of swallowing (VE).

**Methods:** Forty-five dysphagic patients (average age: 75 years) were enrolled in this study between July 2011 and March 2012. DSS scores were obtained from clinical findings and screening tests done by a certified nurse of dysphagia nursing (CNDN). DSS scores were re-evaluated by a dysphagia care team in swallowing rounds using VE. DSS scores obtained using our protocol, CNDN, and swallowing rounds were compared.

**Results:** DSS scores revealed 64% consistency between the protocol and the swallowing rounds, 91% consistency between the CNDN and the swallowing rounds, and 69% consistency between the protocol and the CNDN.

**Conclusion:** Our results indicate that the DSS scores based on clinical findings and screening tests obtained by a skilled CNDN are accurate and consistent with

the DSS rating obtained by the swallowing rounds and the protocol.

**Key words:** certified nurse of dysphagia nursing, screening tests, videoendoscopic evaluation of swallowing, Dysphagia Severity Scale

**Introduction**

A videofluoroscopic examination of swallowing (VF) or a videoendoscopic evaluation of swallowing (VE) is used for accurate evaluation of dysphagia; however, these procedures are not easily performed in patients with possible swallowing disorders. Many screening tests have been developed to diagnose dysphagia in this patient population [1–6]. Although these screening tests are generally used to determine the presence or absence of dysphagia or aspiration, they are difficult to use for assessing the severity of dysphagia.

The Dysphagia Severity Scale (DSS) is a 7-point comprehensive ordinal scale that combines treatment and diet (Table 1) [7]. DSS is clinically useful because VF or VE is not always required to determine the severity of dysphagia. However, it is still unclear if dysphagia severity can be accurately assessed without using VF or VE. This study compared the DSS scores obtained from the clinical findings and screening tests by a skilled nurse with the DSS scores obtained using VE.

**Methods**

Inpatients at our hospital were referred to a certified nurse of dysphagia nursing (CNDN) either directly or by a physiatrist when the ward nurse or attending physician had difficulty managing possible dysphagia. CNDN is the certification given by the Japanese Nursing Association to nurses who pass the examination after professional training that includes

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**Table 1.** Dysphagia Severity Scale (DSS).

| DSS                     | Definition   | Diet and treatment   |
|-------------------------|--|--|
| 7 Within normal limits  | No symptoms of dysphagia   | Regular diet   |
| 6 Minimum problems      | Some symptoms of dysphagia but no need for rehabilitation or exercise.                     | Softened rice and food.<br>Direct therapy if necessary.  |
| 5 Oral problems         | Significant symptoms in the pre-oral anticipatory stage or oral stage without aspiration . | Softened rice and food or paste food.<br>Direct therapy in the hospital or at home.                                      |
| 4 Occasional aspiration | Possible aspiration or aspiration is suspected due to pharyngeal residue.                  | Dysphagia diet, regular diet or use of intermittent oral catheterization.<br>Direct therapy in the hospital or at home.  |
| 3 Water aspiration      | Aspiration of thin liquids; change in food consistency is effective.                       | Dysphagia diet, thick liquids or use of intermittent oral catheterization.<br>Direct therapy in the hospital or at home. |
| 2 Food aspiration       | Food aspiration with no effect from compensatory techniques or food consistency changes.   | Tube feeding or gastrostoma.<br>Direct therapy in a professional medical organization.                                   |
| 1 Saliva aspiration     | Unstable medical condition due to severe saliva aspiration.                                | Tube feeding or gastrostoma.<br>Difficulty with direct therapy.  |

>630 h of lectures on the pathological conditions, evaluation, techniques, and risk management for swallowing disorders and 5 weeks of practical training in a hospital for over 6 months. The CNDN certification is renewed every 5 years [8]. After excluding patients who could not open their eyes without pain stimulation or those for whom oral feeding was difficult due to poor general condition, swallowing rounds using VE were conducted by a dysphagia care team, and the treatment course and diet were determined. The dysphagia care team at our hospital comprises CNDNs, physiatrists, dentists, dental hygienists, speech-language-hearing therapists, and dietitians [9]. Fifty patients were enrolled in the study between July 2011 and March 2012, and DSS scores were determined by a full-time CNDN based on clinical findings and screening tests. DSS scores were re-evaluated during swallowing rounds using VE within 3 days of the initial assessment. Written informed consent was obtained from all patients. Five patients were later excluded from the study because of a change in their level of consciousness and/or general condition between the time of the CNDN assessment and the VE evaluation. Therefore, data from 45 patients was analyzed in this study. The CNDN who rated the DSS using clinical findings and screening tests worked with the dysphagia care team for 16 months and received feedback from >500 VE cases before the start of this study. The CNDN was still involved in the swallowing rounds but did not provide any input for determining the level of DSS during the study.

The CNDN examined the present history, past history, diet before admission, vital signs, blood

biochemical data, chest X-ray images, consciousness level, cranial nerve problems, chest and neck auscultation, and respiratory state and conducted dysphagia screening tests to assess the DSS. The screening tests used here included the repetitive saliva swallowing test (RSST) [2], water swallowing test, and food test (FT) [4] (Table 2). The water swallowing tests included the modified water swallowing test (MWST) [8] (Table 3), and the amount of water was changed or thickening agent was added if necessary. The RSST counts the number of dry swallows in 30 s by palpating the hyoid bone and the laryngeal prominence. Subjects are instructed to perform as many dry swallows as possible, and a score of 2 or less was considered as pharyngeal dysphagia. Figure 1 shows our protocol for assessing DSS using screening tests. DSS was given a score of 1 when RSST was 0 with unstable medical conditions, a score of 2 when no swallow reflex or coughing occurred with 1–2% thick liquid of up to 10 ml, a score of 3 when coughing or wet hoarseness occurred with liquid of up to 10 ml, a score of 4 when coughing or wet hoarseness occurred after drinking a cup of liquid or if pharyngeal residue was suspected with auscultation of the neck in FT, a score of 5 if moderate residue was observed in the oral cavity by FT, a score of 6 if a slight problem occurred, and a score of 7 if no problems occurred. The CNDN used this protocol as a guide but scored DSS by adding other clinical findings and experiences as a CNDN. In the swallowing rounds, thick liquid, thin liquid, jelly, rice gruel, and/or a two-phase mixture were used in VE and the DSS score was determined in a comprehensive manner.

**Table 2.** Food test (FT).

Four grams of pudding was placed on the dorsum of the tongue with a spoon. The subject was instructed to swallow. The entire procedure was repeated two more times if the score was 4 or 5, and the final score was defined as the lowest score in any trial.

Criteria:

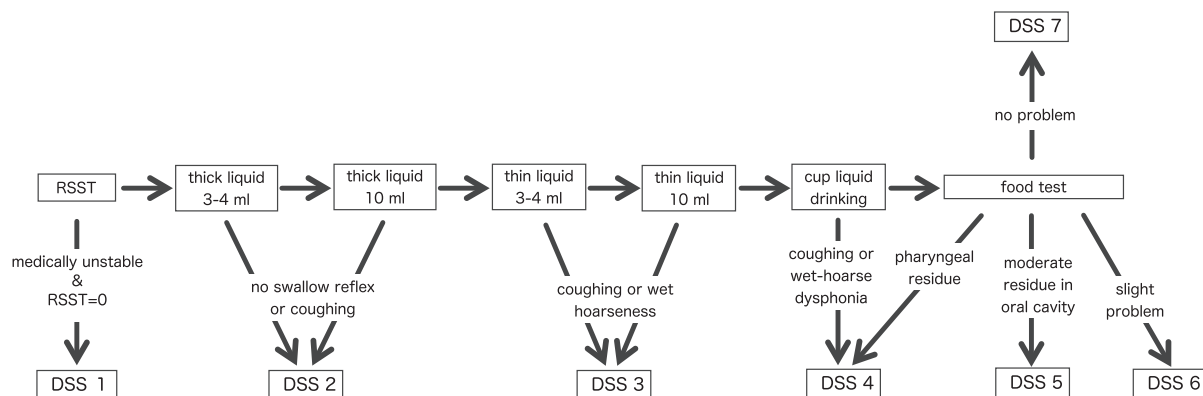
- 1 inability to swallow
- 2 swallowing with dyspnea
- 3 swallowing with cough or wet-hoarse dysphonia or moderate pudding residue in the oral cavity
- 4 ability to swallow without coughing
- 5 ability to swallow and could perform two additional dry swallows within 30 s

**Table 3.** Modified water swallowing test (MWST).

In this test, 3 ml of cold water was placed on the floor of the mouth with a syringe. The subject was instructed to swallow. The entire procedure was repeated two more times if the score was 4 or 5. The final score was defined as the lowest score in any trial.

Criteria:

- 1 inability to swallow
- 2 swallowing with dyspnea
- 3 swallowing with cough or wet-hoarse dysphonia
- 4 ability to swallow without coughing
- 5 ability to swallow and could perform two additional dry swallows within 30 s

**Figure 1.** Our protocol for assessing DSS using screening tests.

The CNDN used this protocol as a guide, but scored the DSS by adding other clinical findings and experiences as a CNDN.

DSS, Dysphagia Severity Scale; CNDN, certified nurse of dysphagia nursing; RSST, repetitive saliva swallowing test.

All analyses were performed using SPSS Statistics 21 (IBM Corporation, NY, USA). DSS scores obtained by the protocol, CNDN, and swallowing rounds were compared using Wilcoxon signed-rank tests with Bonferroni correction. *p*-Values of <0.05 were considered statistically significant.

## Results

The study included 23 men and 22 women with an average age of  $75 \pm 13$  years (mean  $\pm$  SD). The etiology of dysphagia was pneumonia in 13 cases, postoperative

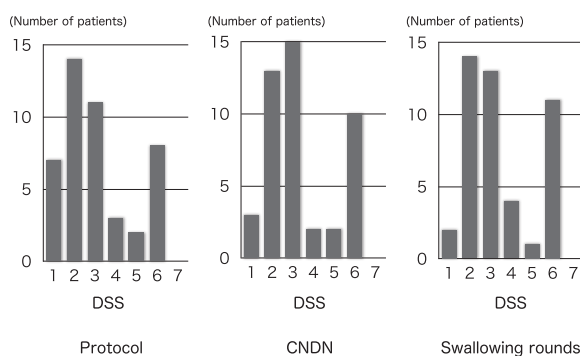
in 13, stroke in nine, and other causes in 10.

The screening tests revealed an RSST score of 0 in 20 cases, 1 in 11 cases, 2 in seven cases, and  $\geq 3$  in seven cases. MWST was not performed in one case due to a high risk of aspiration, in one case due to severe damage in the pre-oral anticipatory stage, and in 17 cases due to coughing in response to thick liquid. FT was not performed in one case due to a high risk of aspiration, in one case due to a severe pre-oral anticipatory stage problem, and in 16 cases due to coughing in response to thick liquid. Therefore, MWST was performed in 26 cases and revealed a

score of 2 in three cases, 3 in 10 cases, 4 in nine cases, and 5 in four cases. FT was performed in 27 cases and had a score of 3 in five cases, 4 in 14 cases, and 5 in eight cases.

The number of patients for each DSS score is shown in Figure 2. Seven patients had a DSS score of 1 that was assessed by the protocol, three had a score of 1 as assessed by the CNDN, and two had a DSS score of 1 as assessed by the swallowing rounds. Scores evaluated by the protocol were significantly lower than those evaluated by the swallowing rounds ( $p = 0.009$ ); however, there were no significant differences between the DSS scores evaluated by the CNDN and those evaluated by the swallowing rounds.

Of the 45 cases, 29 (64%) had DSS scores that were consistent when assessed by the protocol and the swallowing rounds, whereas 41 cases (91%) revealed the same DSS scores when assessed by the CNDN and the swallowing rounds. In 31 cases (69%), the DSS score assessed by the protocol was the same as that by the CNDN. DSS scores assessed by the protocol were higher than those assessed by the swallowing rounds in one case, with a DSS score of 5 assessed by the protocol, and a score of 3 assessed by the CNDN and the swallowing rounds. No cases were scored higher by the CNDN than by the swallowing rounds (Figure 3). Four cases did not reveal the same DSS scores when evaluated by the CNDN and the swallowing rounds. One case was evaluated as DSS 5 by the CNDN because of a severe pre-oral anticipatory stage problem and as DSS 6 by the swallowing rounds. Furthermore, two cases were evaluated as DSS 3 by the CNDN because of wet hoarseness without coughing in the water swallowing tests and as DSS 4 by the swallowing rounds. One case was scored as DSS 1 by the CNDN without trying 3 ml of thick liquid or MWST due to the presence of saliva in the

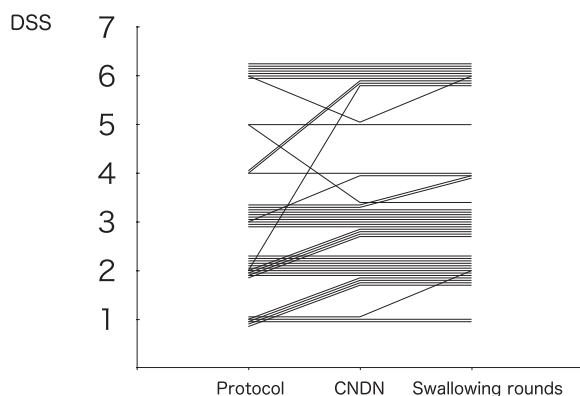


**Figure 2.** Number of patients in each DSS score. Scores evaluated by the protocol were significantly lower than those evaluated by the swallowing rounds ( $p = 0.009$ ). There were no significant differences between the DSS scores evaluated by the CNDN and those evaluated by the swallowing rounds. DSS, Dysphagia Severity Scale; CNDN, certified nurse of dysphagia nursing.

suction line in the tracheostomy tube, and the RSST was 0. This case was scored as DSS 2 by the swallowing rounds. When one category of variation was allowed, consistency between the protocol and the swallowing rounds was observed in 41 cases (91%), between the CNDN and the swallowing rounds in 45 cases (100%), and between the protocol and the CNDN in 41 cases (91%).

## Discussion

Although accurate evaluation of dysphagia requires the use of VF or VE, this study demonstrates that a skilled CNDN could accurately assess DSS in >90% of the cases without using VF or VE. Numerous reports have investigated the sensitivity and specificity of screening tests in predicting aspiration. It has been reported that RSST has 98% sensitivity and 66% specificity in predicting aspiration [2]; however, patients with cognitive impairment or those who cannot understand the instructions often received a score of 0 on RSST. In this study, 20 patients had an RSST score of 0. Another study reported that MWST had 70% sensitivity and 88% specificity, FT had 72% sensitivity and 62% specificity, and that combining MWST, FT, and X-ray before and after swallowing had 90% sensitivity and 71% specificity in predicting aspiration compared with the VF method [4]. Another report revealed that the water swallowing test of 50 ml combined with the oxygen desaturation test had 100% sensitivity and 71% specificity compared with the VE method [3]. Although aspiration is an important finding for dysphagia, penetration, pharyngeal residue, reduced bolus propulsion, and mastication disturbance are also important. The Dysphagia Outcome and Severity Scale (DOSS) is a 7-point comprehensive ordinal scale for dysphagia [10]; however, it is not easy to evaluate DOSS in patients with suspected dysphagia because it requires the use of VF or VE. DSS scores evaluated by comprehensive clinical evaluation and 4-grade VF findings were reported to be consistent in 59% of the cases, and if one category of variation was allowed, the two methods demonstrate consistency in 94% of the cases [11]. Similarly, our results revealed that the DSS scores obtained by the protocol and those obtained by VE were consistent in 64% of the cases and in 91% of the cases between the protocol and VE. Therefore, the evaluation by the protocol was as accurate as the evaluation by the other report; however, the assessment by a skilled CNDN improves the concordance of the scores. Our CNDN obtained clinical findings and performed screening tests before the swallowing rounds and was aware of the results obtained by the swallowing rounds. The feedback that the CNDN received was necessary for learning and improved the concordance. The CNDN underestimated the DSS score in four cases compared with the score obtained by the swallowing rounds. If



**Figure 3.** DSS scores evaluated by the protocol, CNDN, and swallowing rounds.

Of 45 cases, 29 had DSS scores that were consistent when assessed by the protocol and the swallowing rounds, whereas 41 cases revealed the same DSS scores when assessed by the CNDN and the swallowing rounds. The DSS score assessed by the protocol was the same as that by the CNDN in 31 cases.

DSS, Dysphagia Severity Scale; CNDN, certified nurse of dysphagia nursing.

the DSS score is overestimated, the patient may be allowed to take food or water, which can increase the risk of aspiration and cause aspiration pneumonia. In cases where the DSS scores were not consistent, the skilled CNDN understood this risk and assessed the DSS more carefully in order to minimize the aspiration risk.

This study has several limitations. The reliability and validity of our protocol require further examination. However, the rate of concordance between the automatic evaluation by the protocol and the VE was 64%, and the DSS score was higher when assessed by the protocol only in one case. Therefore, we conclude that our protocol is valid for assessing the DSS score. The skilled CNDN accurately evaluated the DSS score in >90% of the cases; however, the degree of skill necessary for accurate evaluation is still unknown. Moreover, the results of this study are derived from only one CNDN, and we do not know if another skilled CNDN would generate the same results. Not all CNDNs have the same level of skill because the education system after acquiring the CNDN designation has not yet been established. Further studies are required to clarify these problems.

Nevertheless, our study shows that DSS scores can be accurately evaluated without VE.

In conclusion, a skilled CNDN may provide accurate DSS scores using clinical findings and screening tests.

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